Water

P.E.I.'s MOST PRECIOUS RESOURCE

MONTAGUE-VALLEYFIELD RIVERS COMPLEX

WATERSHED ACTIVITIES

SURFACE WATER PROGRAM

MARCH 1990

THE CANADA—PRINCE EDWARD ISLAND
WATER MANAGEMENT AGREEMENT

Environment Canada Environnement Canada

Prince Edward Island
Department of the Environment

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WATER MANAGEMENT AGREEMENT

Prepared by:

Environment Canada
Inland Waters Directorate
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P.E.I. Department of the Environment
Fish and Wildlife Branch

SURFACE WATER PROGRAM

MARCH 1990

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PREFACE

This report is one of a series produced as a result of the Canada - Prince Edward Island Water Management Agreement. The work was performed as part of the Watershed Inventory Project under the Surface Water Program.

It was initiated in order to gain a better understanding of the activities which may impact on the quality and quantity of surface waters drained by the Montague and Valleyfield Rivers.

The report is intended to be used in conjunction with the report entitled "Activities Affecting Surface Water Resources - A General Overview" and the book of "Montague - Valleyfield Rivers Watershed Complex Inventory Maps" which is maintained on file at Inland Waters Directorate, Environment Canada in Dartmouth, Nova Scotia. All references to maps contained in this report are to the atlas.

Mapping is performed on the 1:50,000 N.T.S. topographical series using the Universal Transverse Mercator (U.T.M.) grid system to the nearest one hundred (100) metres for point data. Non-point (polygon) data is also mapped where applicable. This data is contained on diskette and is easily transferable to Geographical Information System (G.I.S.) thereby providing for updating and manipulation of the data.

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1.0 INTRODUCTION

In November 1987, the Canada - Prince Edward Island Water Management Agreement was signed. The Agreement focuses upon several areas including groundwater contamination, surface water degradation and estuarine eutrophication. Of these, the Watershed Inventory Project, under the Surface Water Program, was designed to identify current and future users of surface water and to document resource conflicts within twelve watersheds across the province. The Montague - Valleyfield Rivers Watershed Complex (Figure 1.1) was identified as an area of study for the Project.

2.0 GENERAL CHARACTERISTICS OF MONTAGUE - VALLEYFIELD RIVERS WATERSHED COMPLEX

2.1 Description

The Montague - Valleyfield Rivers Watershed Complex is unique on Prince Edward Island in terms of the extensive management project currently being carried out. The project goal is to implement a co-operative land use management plan that will benefit wildlife, agriculture, fisheries and forestry. The five-year project, which began in 1986, was designed to demonstrate to land users and the over twenty-five (25) land resource agencies involved that many benefits of co-operative land use management are possible.

Preliminary studies had concluded that fish and wildlife habitat within the watershed had been deteriorated over the years due to the following factors (Thompson, 1988):

1. long-time forest highgrading;
2. farmland consolidation;
3. hedgerow removal and clean farming practices;
4. soil erosion and sedimentation; and
5. the simplification of natural cover.

Detailed management plans were then prescribed for forested, agricultural and riparian lands of participating landowners. These plans will be discussed in more detail later in this report (refer to Section 10.2).

Changing agricultural practices over the years have reduced the amount and quality of wildlife habitat on the Island. The disappearance of hedgerows and greenbelts has not only resulted in the loss of wildlife habitat but has also contributed to higher erosion rates and lower soil productivities.

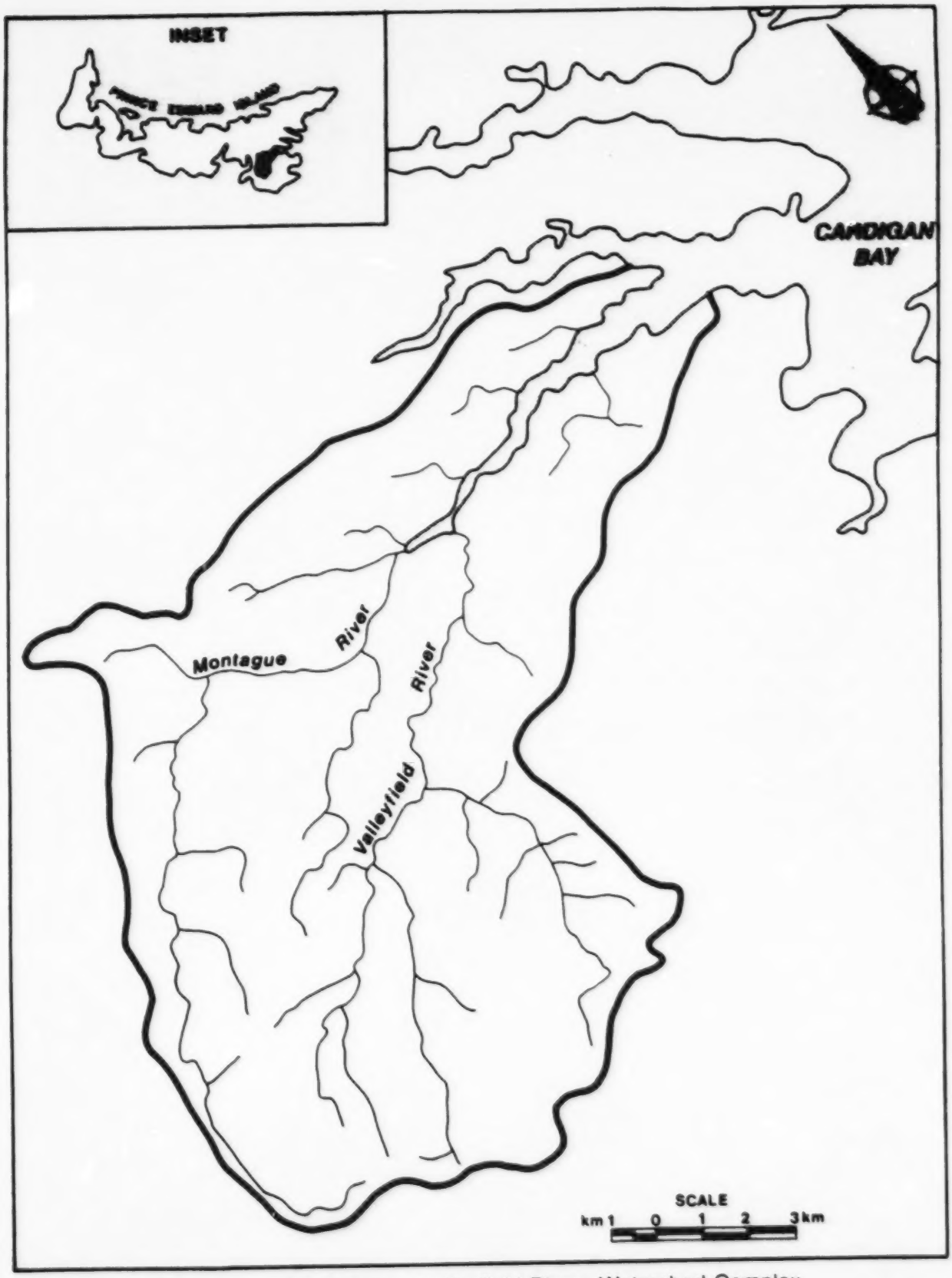


Figure 1.1 Montague - Valleyfield Rivers Watershed Complex

2.2 Physiography

Prince Edward Island's landscape has been influenced largely by the shape of the bedrock and by the ease with which it has been eroded. Low cliffs predominate along much of the shoreline. Especially on the northern headlands, these cliffs have been eroded to form a spectacular series of off-shore and bay-mouth bars. Annual shoreline retreat of more than 0.30 metres is normal and up to four metres has been recorded (Environment Canada, 1968). The southern coastline is more protected with erosion being less pronounced.

The several glaciers which once covered P.E.I. have resulted in a nearly level to gently rolling landscape over much of the province. Approximately three-quarters of the land area is less than fifty (50) metres above sea level, but a few low hills throughout the central section of the Island have elevations of 150 metres. The watershed rises up to nearly 110 metres above sea level in the southwest section but generally is mostly rolling in nature.

A physiographic comparison between Prince Edward Island and the Montague - Valleyfield Rivers Watershed Complex (Figure 2.1) reveals that the watershed has more forested land than the Island (Taylor, 1988). Over one-half of the nearly two hundred square kilometres (199.70 km^2) is forested. Forty-one percent (41%) is cleared while estuaries, swamps and ponds compose about five percent (5%) of the area. Agricultural land use has a significant impact on surface waters. During the summers of 1987 and 1988 land use practices in the Montague River subwatershed were determined. This information has helped in identifying those areas that have a high erosion potential (refer to Section 10.2.3).

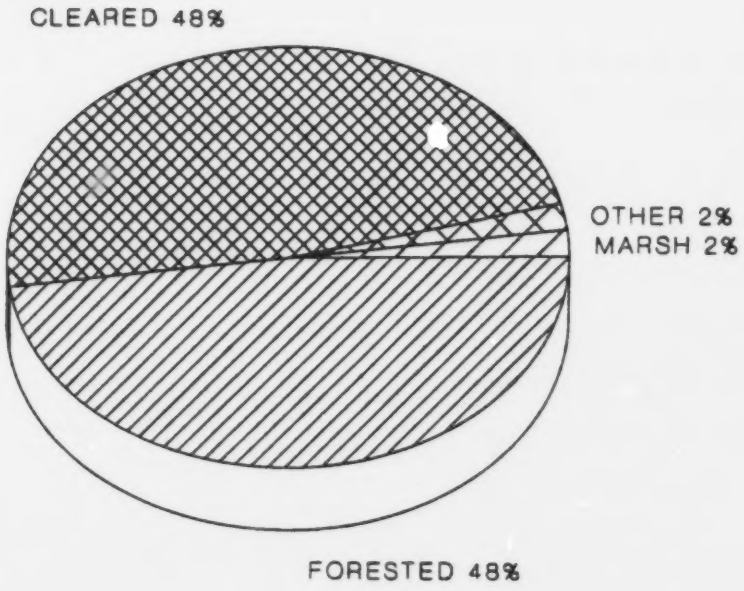
There are in excess of one hundred and sixty kilometres (160 km) of rivers, streams and brooks within the watershed. Although ponds comprise only 0.2% of the total area, they provide significant habitat for fish and wildlife, opportunities for finfish aquaculture and sources of water for agriculture.

2.3 Soils

Prince Edward Island's podzol soils, formed from both the weathering of bedrock and the deposition of glacial till, are generally stone-free, sandy and permeable. Sandy loam soils have good drainage, but the clay loams restrict moisture movement and are imperfectly to poorly drained. All soils on P.E.I. are characterized by a low natural fertility.

The Montague - Valleyfield Rivers Watershed Complex is

PRINCE EDWARD ISLAND



MONTAGUE - VALLEYFIELD RIVERS WATERSHED

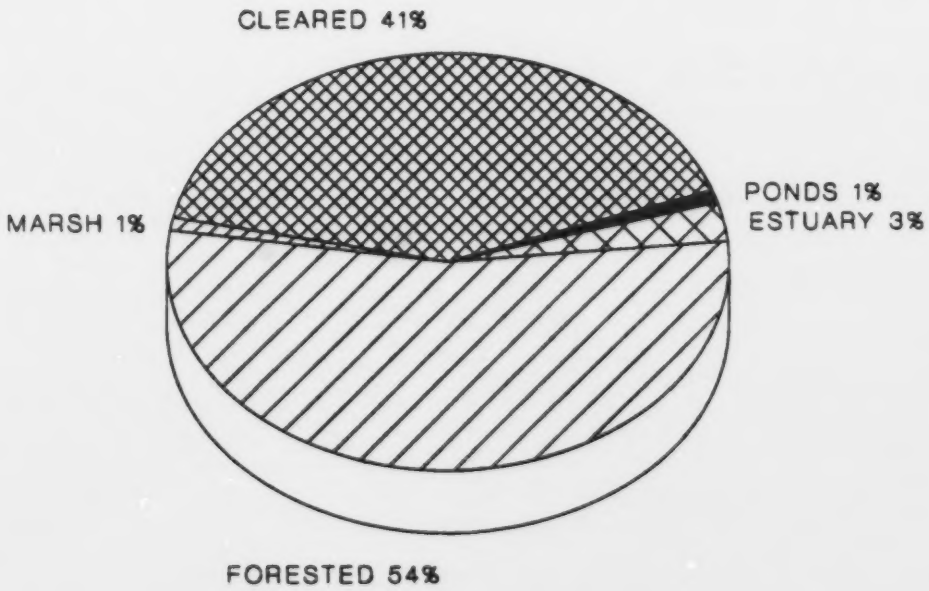


Figure 2.1 Comparison of Physiography Between Prince Edward Island and The Montague — Valleyfield Rivers Watershed Complex

composed of five classes and three subclasses of mineral soils. Most of the watershed is characterized by Class 3S and 4S soils with less extensive areas of Class 2S, 4T, 5T, 5^{s}_{w}, 7T and 7^{s}_{w} mineral soils also present (Canada Land Inventory, 1968).

3.0 AGRICULTURAL OPERATIONS

As it does with the Island as a whole, agriculture forms a major part of the watershed's economy and energy intensive crops such as tobacco and potatoes are abundant. Major livestock operations, however, are not as prevalent as they are in other watersheds throughout the province (Map 11L/2).

3.1 Dairy Operations

There are three dairy operations (Figure 3.1) in the watershed each containing thirty (30) or more head of cattle (30 milkers and 30 feeders), (Younie, 1988). The major concerns with dairy operations as they relate to surface water resources focus upon the effects of storage and disposal of manure and stock watering.

3.2 Beef and Feedlot Operations

Ten beef farms (Figure 3.1) are located in the watershed each with fifty (50) or more head (50 cattle plus 50 feeders), (Younie, 1988). None of these operations contain feedlots. As with the dairy operations, the major problems associated with beef cattle farms result from the storage and disposal of manure and the unrestricted access of the cattle to streams and rivers.

3.3 Hog Operations

There are six large hog farms in the watershed (Figure 3.1). Few concerns are associated with them since the hogs are housed indoors. However, there can be adverse effects on the quality of surface water as a result of the storage and disposal of manure (Younie, 1988).

3.4 Sheep Operations

There are also three sheep farms (Figure 3.1) in the watershed (Younie, 1988). Two of the operations are relatively close to surface waterways potentially affecting its quality as a result of pasturing the animals.

3.5 Fox Farms

There are five fox farming operations (Figure 3.1) located

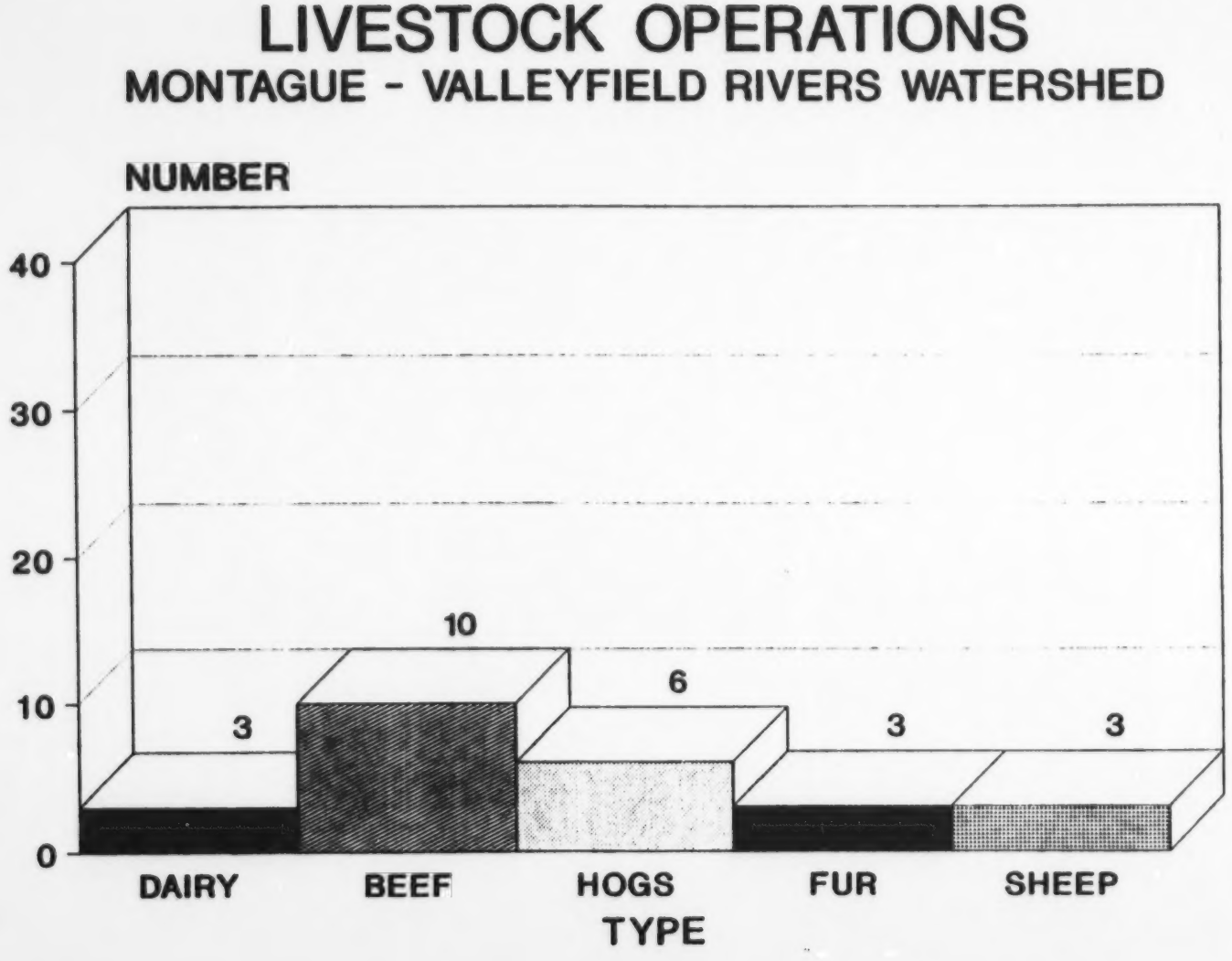


Figure 3.1 Livestock Operations Located Within The Montague – Valleyfield Rivers Watershed Complex

in the watershed (Younie, 1988). Since the foxes are caged these operations pose little or no threat to surface water resources.

3.6 Tobacco Farms

Eighteen (18) tobacco farms are located in the watershed. Primary concerns associated with these operations in relation to surface water quality are; chemical contamination, resulting from pest and weed control spraying and soil erosion. The very nature of growing tobacco and other row crops and the preference for sandy soils makes this type of agriculture a real threat to the finfish and shellfish populations within the Montague and Valleyfield Rivers.

3.7 Stock Watering

Most P.E.I. livestock are watered using groundwater piped into troughs (Murphy, S., 1988). However, specific areas in which cattle drink from streams and rivers flowing through pastures have been observed during fieldwork (refer to section 11.1). This practice results in bank erosion, siltation and bacterial contamination of the water presenting additional problems for other users of the resource, including fish and wildlife.

3.8 Spraying Operations

Many tobacco farmers within the Montague - Valleyfield Rivers Watershed Complex are making a transition from using hazardous sprays to using ones of low hazard or none at all, relying instead on manual labor to control weeds.

Insecticides are usually applied only once during the tobacco growing season. Aphids, which at one time were a major problem, are now being biologically controlled through the use of ladybugs thus rendering spray treatments unnecessary.

Cutworms were quite numerous in 1988 due to the absence of frost in the ground during the previous fall and winter. Tobacco farmers were required to control the cutworms using chemical sprays for the first time in three years. (Martens, and Mermuys, 1988).

Potatoes, however, are generally given a few applications of herbicides per growing season including top killers which are applied just prior to harvest.

3.9 Irrigation

The P.E.I. Department of Agriculture does not maintain

specific records on irrigation. It is known, however, that at least three farmers irrigate their tobacco crops, especially during the drier seasons. Most of the water for irrigation comes from near-by streams (Younie, 1988). This activity may affect the amount of water available within the same aquatic system for other users and, therefore, should be monitored in order to protect against its overuse.

3.10 Erosion Control Projects

There are sixteen erosion control projects within the Montague - Valleyfield Rivers Watershed Complex, (Table 3.1). Of these, nine were completed before the Soil and Water Conservation and Management Program was implemented in 1984 (Brown, 1988). The Program expired on March 31, 1989 (Pharo, 1989). Tile drainage projects enable farmers to increase the productivity of low class agricultural lands (DeHaan, 1989).

Table 3.1 Erosion Control Projects Located Within the Montague — Valleyfield Rivers Watershed Complex

TYPE	NUMBER
Tile Drainage	10
Grassed Waterway	4
Diversion Ditch	2
TOTAL	16

3.11 Dead Stock Burial Sites

There are no dead stock burial sites within the watershed. Farmers in this area, however, may pay an annual membership fee to Maritime Pet Food, located in Hunter River, P.E.I. to have their dead stock removed or they may bury them on their own property (Younie, 1988).

4.0 FISH AND WILDLIFE RESOURCES

Fish and wildlife on P.E.I. are dependent upon surface water resources for either primary habitat or a drinking source. Significant revenues are contributed to the province as a result of fish and wildlife related activities.

4.1 Angling, Hunting and Trapping Areas

Angling, hunting and trapping areas do not have rigid boundaries due to the migratory habits of fish and wildlife and are, therefore, not static. The Montague - Valleyfield

Rivers Watershed Complex has been arbitrarily divided into three sections (A, B and C), (Map 11L/2) in order to facilitate the delineation of the angling, hunting and trapping areas (Stewart, 1988).

Sections A and B include the lower drainage areas of the Montague River. All ponds in this area have considerable speckled (brook) trout populations and are popular angling sites. The section of the river between the Montague Bridge and the Upper Montague Bridge consist mainly of sea run brook trout, however, rainbow trout are also angled. As well, all other brooks and tributaries within this section are utilized for stream fishing.

Trapping in Sections A and B is quite common especially within the upper reaches of the river. Beaver, fox, muskrat, mink and raccoon are all trapped in these areas.

Ruffed grouse hunting, and to a lesser extent, woodcock hunting, are quite common in all areas in the watershed. Black ducks are also hunted by "jump shooting" in ponds and along streams.

In Section C, there is brook trout fishing off most points in the river, especially during the migratory periods. 1988 was an exceptionally good year for sea run brook trout in the lower regions of Section C.

Waterfowl hunting in Section C consists mainly of scaup, goldeneyes, oldsquaw and mergansers during the early part of the winter. There are also a few black ducks taken during the season. Very little trapping occurs in this area.

4.2 Beaver Activity Areas

Beaver-built dams result in the creation of flowages. These areas vary in size. There are five known active beaver dams (Map 11L/2) within the Montague - Valleyfield Rivers Watershed Complex. Some of them are being removed as part of the stream enhancement program within the watershed. As well, there are many abandoned dams which may affect the quantity of water available for downstream users of the resource although they will be selectively removed during the Montague River Watershed Integrated Management Pilot Project.

5.0 RECREATIONAL ACTIVITIES

Many recreational activities on Prince Edward Island occur near or around surface waters. They may or may not have detrimental effects on the resource depending upon the amount of use and the numbers of people near the water.

5.1 Provincial Parks / Private Campgrounds

There are no provincial parks or private campgrounds located in the watershed. However, Brudenell River Provincial Park is located just outside of the watershed and many of their scheduled recreational activities overlap into the Montague - Valleyfield Rivers Watershed Complex.

5.2 Swimming Areas

There are not any organized swimming areas within the Montague - Valleyfield Rivers Watershed Complex (MacLean, 1989). However, people are known to swim in several tributaries of both the Montague and Valleyfield Rivers. The most frequented locations are; Sutherlands Hole, the Montague Wharf and in Lower Montague at Robinsons Cove, between Landrys Point and Aitken Point.

5.3 Boating / Canoeing Areas

Several sites in the watershed are suitable for boating and/or canoeing. The Prince Edward Island Recreational Canoeing Association has mapped specific routes in the watershed (P.E.I. Department of Tourism and Parks, n.d.).

In the past, Brudenell River Provincial Park had organized a canoe race on Labour Day weekend. The entrants started below the Montague Bridge and continued along the river to the Park. However, since the number of entries had declined over the past few years, it was decided that the races will no longer be held. Instead, a boardsailing regatta, which in 1988 attracted 25 - 30 participants, will be held on an annual basis. The course begins at Georgetown Harbour (outside of the watershed) and continues up the Montague River ending at the landing behind the Lobster Shanty North Motel and Restuarant (Map 11L/2).

As well, the Annual Montague River Raft Races are held during "Welcome to Summer Days". Approximately fifty (50) rafts (200 people) participate each year. The course runs (Map 11L/2) from the Upper Montague Bridge to the landing behind the Lobster Shanty North Motel and Restuarant. The rafts may be constructed with anything that will float, however, motorized rafts are not permitted (VanWeichen, 1988).

Manada Cruises offers boat cruises on the Montague River. They are in operation from June 1 to September 30 making four daily runs. The route (Map 11L/2) begins at the Montague Wharf, continues up the river to Georgetown Harbor, to the seal colony at St. Andrews Point, up the Brudenell River to

Brudenell Basin and then back to the Montague Wharf (Bears, 1988).

5.4 Hiking / Cross-Country Skiing / Snowshoeing

There are no designated trails for outdoor hiking, cross-country skiing or snowshoeing within the watershed. However, there are many cut lines, logging and seasonal roads and abandoned rail lines which are suitable for these activities. The Southwestern Tourism Association is also trying to develop winter tourism in this area through the promotion of cross-country skiing. As well, many tourist home operators who have available land are creating cross-country ski trails on their properties (VanWeichen, 1988).

5.5 Snowmobiling / Horseback Riding

There are not any snowmobiling clubs located in the watershed and, therefore, no organized excursions. Snowmobilers, however, have been observed riding through fields and along abandoned rail lines and seasonal roads. There are no horseback riding trails within the watershed. However, there are horseback riding facilities located at Brudenell River Provincial Park (VanWeichen, 1988).

5.6 Unplowed (Seasonal / Scenic Heritage) Roads

There are several roads within the Montague - Valleyfield Rivers Watershed Complex which are not plowed during the winter (Map 11L/2). These roads provide trails for cross-country skiing, snowshoeing and snowmobiling. Since most of these roads are not heavily travelled, they are also excellent hiking, cycling and horseback trails during the warmer seasons.

Two roads have been designated as Scenic Heritage Roads due to their historical significance and their natural and undeveloped character (Map 11L/2), (Horne et. al., 1988).

6.0 FISHERIES OPERATIONS

All finfish and shellfish harvesting within the Montague - Valleyfield Rivers Watershed Complex can be placed into three broad categories: licensed commercial, non-licensed commercial and recreational and finfish aquaculture.

6.1 Licensed Commercial

The Montague River is closed to all shellfish harvesting and direct consumer purchasing. However, conditional permits may be issued for mussel relocation to non-contaminated

areas. Three permits have been issued for the area (Murphy, L., 1988).

Commercial smelt fishery operations also require licensing. The Montague commercial smelt fishery is a small operation with only three permits issued in 1987. The smelts are either kept for personal use by the fishermen or are sold on a limited commercial scale. Smelts are usually caught with gill nets (Sheidow, 1988).

6.2 Non-Licensed Commercial and Recreational

The most recent estuarine resource inventory completed for the Montague River (MacWilliams and Judson, 1973) provides detailed information concerning the occurrence and relative abundance of various shellfish species. Significant distributions of blue mussels, soft-shelled clams, oysters and quahogs have been identified within the system (Map 11L/2).

As mentioned previously, the Montague River is closed to all shellfish harvesting with the exception of conditional permits which are issued for mussel relocation to non-contaminated areas. However, recreational finfish harvests within the watershed are quite significant (Stewart, 1988).

Recreational smelt fishing is also common to the Montague - Valleyfield Rivers Watershed Complex. Presently, there are no licensing requirements for ice-fishing smelts, but future plans include a licensing system in order to control the abandonment of smelt shacks during spring break-up (Sheidow, 1988).

6.3 Finfish Aquaculture

During the past few years finfish aquaculture has gained considerable momentum on Prince Edward Island. There are two finfish aquaculture operations located within the Montague - Valleyfield Rivers Watershed Complex (Map 11L/2). One, Prowses Pond (Bens Lake), is a fishing pond containing approximately 40,000 rainbow and speckled trout which is located on the Valleyfield River, system. The second operation is situated on MacPhersons Pond near the headwaters of Browns Creek, a tributary of the Valleyfield River. It is a cage system containing about 10,000 rainbow trout. There is no waste retention or treatment system in place on either of these operations (Murphy, L., 1989).

Problems may also arise at these finfish aquaculture sites resulting from the escape of rainbow trout. They compete directly with salmon parr as they utilize the same riffle areas in the streams. Therefore, the survival of

newly-stocked salmon partly depends upon the ability of finfish aquaculture operations to control their stock from escaping into natural systems.

7.0 INDUSTRIAL OPERATIONS

Many industrial activities are closely associated with surface water resources. For example, some sewage treatment facilities and food and beverage processing plants discharge both treated and untreated wastes directly into waterways. Other industrial sites such as landfills and salt/sand storage locations, may allow for seepage of pollutants to both groundwater and surface water sources. The Montague - Valleyfield Rivers Watershed Complex is not a heavily industrialized area although the potential for contamination exists from the activities which are already present.

7.1 Sewage Treatment Facilities / Lagoons

The Town of Montague has a sewage treatment facility (Map 11L/2) which treats wastes aerobically. Chemicals are not used during treatment of the wastes except for chlorine which is added just prior to the effluent being discharged into the Montague River. The plant has an average daily treatment volume of approximately 340,000 litres (Green, 1988).

7.2 Stormwater Drainage

The Town of Montague is served by a stormwater drainage network which is connected to the sewage treatment plant. Thus, stormwater runoff does receive primary treatment prior to being discharged into the river as there are also several stormwater drainage outlets which disharge directly into the Montague River without receiving treatment.

7.3 Food and Beverage Industry

Since the Montague - Valleyfield Rivers Watershed Complex is not a heavily industrialized area, the effects of industrial operations on the quality or quantity of surface waters are minimal. Montague Dairy (Map 11L/2) has a daily discharge which is directed to the sewage treatment plant for processing. The effluent, therefore, presents little or no threat to the quality of the water in the Montague River.

7.4 Abandoned, Unapproved and Active Dump Sites

There are thirteen abandoned or unapproved dump sites within the Montague - Valleyfield Rivers Watershed Complex. Of these, two are Priority I, five are Priority II and six are Priority III sites (Map 11L/2). There are, however, not any

active landfill or container sites in the watershed. Refuse collected from the Town of Montague is taken by private contractor to the municipal landfill located in the Cardigan River Watershed (Green, 1989).

7.5 Excavation Pits

There are eleven registered excavation pits located within the watershed (Map 11L/2). Records are not maintained concerning the quantity of material taken from individual pits (Murphy, C., 1988). As well, there may be other pits present within the watershed which have become inactive or abandoned over the years.

7.6 Salt / Sand Storage Locations

The P.E.I. Department of Transportation and Public Works maintains a number of salt/sand storage locations across the Island. These locations often change annually, thereby yielding both active and abandoned sites. There is only one active salt/sand storage location within the Montague - Valleyfield Rivers Watershed Complex (Map 11L/2).

7.7 Snow Dumping Sites

Most of the snow removed from the streets of Montague is dumped into a vacant lot near the Montague Sewage Treatment Facility. The snow was previously dumped directly into the Montague River at either of the two following locations; the Montague Wharf or over the bank near Vuozzo's Barber Shop (Map 11L/2). Erosion and runoff from the latter area is evident since the bank is quite steep and lacking in stabilizing vegetation. However, this practice ceased prior to the winter of 1988 - 89 since there was concern over the amount of garbage being dumped into the river with the snow.

7.8 Rail Line Activity

All rail lines across Prince Edward Island were abandoned effective January 1990 since trucking can provide a more efficient method of transporting goods. All rail lines in the watershed were abandoned some time ago (Map 11L/2).

8.0 ALTERATIONS OF NATURAL FEATURES OF WATERWAYS

8.1 Application Process and Requirements

Individuals or groups wishing to alter a watercourse either directly (dam construction and pond creation) or indirectly (excessive cutting or removal of trees) to improve recreational potential, to provide a reservoir for

agricultural use or fire protection or to construct a stream crossing, must first seek approval from the Watercourse Alteration Advisory Committee.

There must be guidelines met during the construction process to satisfy both the Provincial and Federal governments. The P.E.I. Government has jurisdictional responsibility for water resources within the province (Environmental Protection Act, Section 10) while the Federal Government is concerned with the conservation of the fishery and the protection of fish habitat (Canada Fisheries Act, Chapter F-14, Section 20).

8.2 Fishways

Whenever an alteration is made to a stream, the continued passage of fish must be ensured. There are two fishways within the Montague - Valleyfield Rivers Watershed Complex that were identified and field checked during the migration period (July 1988). Both are vertical slot and were found to be in average to good condition.

Gaspereau and smelt were observed at the entrance to the fishway at Knoxs Dam. However, both species were unable to navigate their way through the vertical slot fishway.

8.3 Dam Inspections

Of the seventeen dams located in the watershed (Taylor, 1988), thirteen were found to constitute partial barriers to fish passage, two were complete barriers and two were fishways. All of the dams were field checked and a determination made as to their ability to pass fish during migration periods. Due to the continued habitat improvements being carried out as part of the Integrated Management Project, many of the obstructions will be corrected.

8.4 Road - Stream Intersections

All road-stream crossing structures within P.E.I. must be approved by the Watercourse Alteration Advisory Committee. The P.E.I. Department of Transportation and Public Works maintains a reference map and files containing the specification and condition of all major crossings in the watershed. There are thirty (30) such structures within the watershed (Map 11L/2).

There are also thirty-eight (38) additional road - stream intersections which were identified by visual location on the 1:50,000 N.T.S. maps (Map 11L/2). Records are not maintained by the Department of Transportation and Public Works for these structures.

8.5 Rail - Stream Intersections

As mentioned previously, the rail lines within the watershed have been abandoned for some time. There are, however, two rail - stream intersections (Map 11L/2). One crosses an intermittent stream, Rourkes Creek, while the other is at Vesseys Creek. Both waterways are small tributaries of the Montague River.

9.0 WETLANDS

Wetlands include salt marshes, intertidal flats, bogs, freshwater marshes, swamps and small ponds. During 1983-84, all wetlands on Prince Edward Island which were over 0.25 hectares in size were inventoried. The overall objective of the inventory was to provide information pertaining to classification, size, distribution and wildlife value of the wetlands.

9.1 Freshwater Wetlands

All freshwater wetlands within the Montague - Valleyfield Rivers Watershed Complex were identified during the project and were given a wildlife value based on a variety of parameters including; water chemistry, wetland juxtaposition, size, topographic and hydrologic location and surrounding habitat. The wetlands were scored between 36 and 108 with a score of 60+ indicating generally more productive areas.

Thirty (30) freshwater wetlands with a score of 60+ are located in the Montague - Valleyfield Rivers Watershed Complex (Map 11L/2), (Canadian Wildlife Service, n.d.).

9.2 Coastal Wetlands

Coastal wetlands across the Island were also identified during the inventory. They were classified and scored as coastal units. There are no such units located within the watershed.

9.3 Ducks Unlimited Canada Management Sites

Ducks Unlimited Canada (D.U.) is active in Prince Edward Island in the enhancement and management of wildlife habitat. There are two active D.U. projects in the watershed. They are located at Knoxs Pond and Egolfs Pond (Map 11L/2), (Dibblee, 1988).

10.0 ADDITIONAL ACTIVITIES WITHIN THE MONTAGUE - VALLEYFIELD RIVERS WATERSHED COMPLEX

10.1 Hydrometric Stations / Water Chemistry Data

During the period of August 1919 to June 1933, the Water Quality Branch of Environment Canada maintained a hydrometric station on the Montague River (NAQUADAT No. 01CE002) above the Montague Power House. A second station (NAQUADAT No. 01CE005) was established on the Montague River near the Head of Montague in 1987 by the Environmental Management Division, P.E.I. Department of Community and Cultural Affairs. Land use characteristics for each of these stations have been determined by the Inland Waters Directorate, Environment Canada in Dartmouth, Nova Scotia and are listed in Table 10.1.

Table 10.1 Land Use Characteristics of Hydrometric Stations Located Within the Montague — Valleyfield Rivers Watershed Complex

Station Number	Drainage Area (km^2)	Forest Area (km^2)	Cleared Area (km^2)	Swamp Area (km^2)	Pond Area (km^2)	Basin Perimeter (km)	Total Length of Stream (km)	Stream Gradient (%)	Period of Record
01CE002	50.30	26.70	23.50	0.07	0.01	43.10	41.90	0.38	1919-1933
01CE005*	43.30	23.30	19.80	0.07	0.01	41.50	37.00	0.39	1987-PRESENT

* ACTIVE

10.2 Montague River Watershed Integrated Management Pilot Project

The Montague River Watershed Integrated Management Pilot Project is an intensive five-year study which was implemented in 1986. The objective of the Project is to incorporate a co-operative land use management plan that will benefit wildlife, agriculture, forestry and fisheries. It will also identify environmental and ecological problems and their sources. A detailed account of the progress of the Project may be found in Integrated Land Management · Montague River Watershed, Wildlife Habitat Canada (Thompson, 1988).

10.2.1 Stream Enhancement Activities

Prince Edward Island streams and rivers have long been plagued by sedimentation and siltation. However, in recent years, the problems have been further compounded by new and more intensive agricultural practices and the extensive upgrading and paving of roads within the province.

Problems with streams and rivers in the Montague - Valleyfield Rivers Watershed Complex include the following (Thompson, 1988):

- widening and shallowing;
- constant heavy silt burden and sedimentation in streams and estuaries;
- infilling of ponds;
- widespread accumulation of natural debris;
- loss of gravel spawning redds and of stream deeps;
- unstable stream banks;
- loss of stream shading;
- obstruction of fish passage;
- elevation of summer season water temperature;
- excessive production of aquatic plants; and
- reduced growth and abundance of brook trout.

Once stream improvements have begun, stream flow increases resulting in a flushing of accumulated sediments and a reduction in stream width. The stabilization of streambanks is also being carried out through seeding or natural regeneration of suitable grasses and herbaceous or woody plants. Stream shading and runoff reduction can be accomplished through the establishment of greenbelts alongside the streams.

As part of the stream enhancement activities on the Montague River, a study was initiated in which the stream's response to habitat improvement efforts and the response of brook trout to the physical improvements are to be measured. Various physical and chemical parameters will be surveyed both before and after the stream clearing work is performed. As well, fish densities and use of available habitat by different age classes will be measured (McLennan, 1988).

A Department of Fisheries and Oceans study is also being carried out in which the before and after effects of the installation of stream habitat improvement devices such as rock gabions, log deflectors and lowhead weirs are to be measured. Biological parameters which are to be measured within each 100 metre plot include; size and age distribution of fish, biomass of fish within the section and benthic (bottom) sampling (Thompson, 1988).

Post-installation of improvement device surveys will also delineate where the fish were located, that is, are they using the newly created habitat areas. These post-installation surveys should be performed several weeks, several months and one year after the devices have been installed.

10.2.2 Finfish Population Studies

There were nine sites established for determining fish population structure (Map 11L/2). At seven of the sites 100 metre sections of the stream were electrofished in order to sample the populations. The remaining two sites consisted of a three hundred (300) metre and a five hundred (500) metre section. Both were spot checked in order to determine population size. Fish fork lengths were used to determine age class. The objectives of the study are to determine fish population structure and whether or not previous stream improvements are beneficial to fish populations (McLennan, 1988).

A fish trap was also established in the vertical slot fishway at Knoxs Dam on the Montague River to assess populations. The captured fish were weighed, measured, tagged and scale samples were taken before being released.

Also, as part of fish population enhancement studies on the Montague River ten thousand (10,000) brook trout, reared at the Cardigan Fish Hatchery, were released in two locations in the watershed. Five thousand (5000) fish, whose left pelvic fin was clipped, were released at MacRaes abandoned site in Heatherdale while an additional five thousand were released into the Montague River at the County Line Road (Map 11L/2) with their right pelvic fin clipped. The clipped fins on the fish enables Project staff to trace the movements of the fish after they have been retrapped or angled.

10.2.3 Land Use Survey

An agricultural land use survey was conducted during the month of July 1988. The information was used to determine cropping practices in the watershed.

As part of the study, a 1988 risk map was developed for the watershed in which areas of susceptibility to soil erosion were delineated and ranked (Figure 10.1). The purpose was to target high risk areas for the allocation of remedial resources.

10.2.4 Wildlife Habitat Evaluation

Sixteen experimental forestry plots established in the watershed. Each was to undergo one of several forest management prescriptions and was designed with the objective of the Management Project in mind. The projects were carried out by three students from the University of Prince Edward Island as part of their Honors programs.

Figure 10.1 Potential Average Annual Soil Loss For Montague Watershed (1988)

A ground vegetation survey was conducted in which collected data included: ground cover lists with estimates of cover abundance, soil samples and photographs. The objectives of this study were (Kelly, 1988):

1. to provide baseline data over a five year period, monitoring vegetative change under a variety of silvicultural applications,
2. to determine the characteristic flora of eastern Prince Edward Island,
3. to define floristic associations within various forest stand types, and
4. to calculate soil pH, organic content, nutrient content and to determine relationships of vegetation to previous land use.

A second study which was to determine changes in usage by mammals in each forest plot as a result of the watershed enhancement activities was initiated. Linear transects were established and surveyed on February 8 and March 7, 1988. A track index was subsequently calculated for the seven species of animals within the woodlot. Track indices were also calculated for each of the individual tree stands in the woodlot. As well, a contact index was developed to indicate the usage of the woodlot by breeding birds (Farmer, 1988).

A small mammal inventory was conducted during 1987 within woodlots undergoing various forestry prescriptions. The objectives of this project were to establish baseline data of species diversity and relative densities for future use by wildlife (Wilson, 1988).

This project was continued during the summer of 1988 by the Montague Watershed Management Project staff.

10.2.5 Wood Duck Nest Box Establishment

Wood duck populations are relatively low within the Montague - Valleyfield Rivers Watershed Complex. Thirteen nest boxes were subsequently established. The boxes were then periodically checked and all wood duck sightings were recorded. Continual monitoring will determine the extent of the populations.

10.2.6 Snag Utilization By Cavity Nesters

During the period of January to March 1989, an investigation into the use of snags (dead and/or dying trees) within the riparian zone of a section of the Valleyfield was undertaken. The study area incorporated the north face of the river slope for a length of 470 metres (Map 11L/2). Fourteen nest cavities and forty-six (46) feeding snags were

identified.

The retention of suitable snags during riparian zone management was recommended as a result of the study. Many species of birds utilize nest cavities including; flickers, blacked-capped chickadees, red-breasted nuthatches and several species of woodpecker (Dornan and Judson, 1989).

10.2.7 Demonstration Projects

During the summer of 1988, a section of ditch on the Settlement Road, an unpaved road which crosses the Montague River (Map 11L/2) was surveyed and prepared for the installation of GEOWEB, a ditch erosion control device. The Geoweb was installed along with an underlying filter fabric (Mirafi) and a series of check dams. The purpose of the project was to control the amount of sediment runoff into the Montague River during periods of spring runoff or rain (Inland Waters Directorate, 1989).

Also, in order to assist in controlling siltation and bacterial contamination of the Montague River as a result of unrestricted cattle access into the stream, an extensive section of the river running through a community pasture in Grandview was fenced (Map 11L/2). There are access points for the cattle along the fence to the water but the damage caused to fish habitat by the watering livestock will be reduced significantly.

11.0 ACTIVITIES AFFECTING SURFACE WATER RESOURCES WITHIN THE MONTAGUE - VALLEYFIELD RIVERS WATERSHED COMPLEX

Many of the activities affecting surface water resources within the Montague - Valleyfield Rivers Watershed Complex occur as a result of the high erodibility of P.E.I. soils. Formed by the breakdown of underlying sedimentary bedrock, the topsoil is especially prone to destabilization caused by natural weathering and is accelerated by poor agricultural, highway maintenance construction and forestry practices. These problem activities can be placed into three general categories, namely; sedimentation (siltation) sources, pollution point sources and instream obstructions.

11.1 Sedimentation (Siltation) Sources

The entry of soil into surface waterways is described by the Watershed Inventory Project as a sedimentation (siltation) source. Autumn tillage, particularly plowing with the slope and cultivation excessively close to the streams' edge, often results in extensive landwash and siltation of the Island's waterways. Improper forestry operations, such as clearcutting

on steep slopes and removal of greenbelts along streams and rivers also provides for sedimentation of streams and rivers.

One of the major sources of siltation to Island waterways is caused by the construction and maintenance of P.E.I. roads. Many roads on the Island are unpaved which presents numerous potential sources of sedimentation. Improper grading of these roads, in particular, leaving a ridge of clay and sand at either edge allows runoff water to form channels causing erosion to the road surface. Water usually flows alongside these ridges until it "breaks" through, usually at a road-stream intersection. This practice of grading also renders ditches, if present, useless.

Silt-loading of Island streams and rivers does not usually affect the waterway at the point of entry but its effects are impacted further downstream. Soil particles are carried by currents and deposited in the stream covering essential finfish spawning areas. Shellfish beds within the estuaries at the mouth of the rivers and streams are also affected in that they are smothered by the silt.

11.1.1 Heatherdale I

Cattle from a local dairy operation have free access to a stretch of Browns Creek, a tributary of the Valleyfield River (Map 11L/2). Though the operation is small, there is considerable bank erosion and potential for bacterial contamination to the stream.

11.1.2 Heatherdale II

An abandoned logging road which crosses a tributary of Browns Creek (Map 11L/2) is beginning to wash away resulting in silt loading and blockage of the stream.

11.1.3 Union Road

Pasture fence extends across the stream which allows the livestock free access (Map 11L/2) resulting in siltation and bacterial contamination to the waterway.

11.1.4 South Montague Road

There is considerable siltation occurring to a stream resulting from the erosion at the road - stream intersection (Map 11L/2).

11.1.5 Brooklyn

Evidence of cattle watering in a tributary of Browns Creek is identified as an area of bank destabilization and bacterial

contamination (Map 11L/2).

11.1.6 Iona

A logging road which crosses a tributary of the Valleyfield River (Map 11L/2) has been eroded resulting in siltation to the stream.

11.2 Pollution Point Sources

The entry of non-natural substances into a surface waterway is known as a pollution point source. For example, fertilizer and manure runoff into surface waterways results in bacterial and chemical contamination of the system. Inadequately or improperly treated human sewage, stormwater drainage and the discharge of industrial effluents also contribute to the deterioration of P.E.I.'s surface water quality.

The most recent examples of pollution point sources on the Island have been the entry of petroleum products, specifically gasoline, into streams, rivers and groundwater aquifers. This has resulted from either transportation accidents or leakage from underground storage tanks.

In many cases, the result of these pollution point sources is the eutrophication of the aquatic system. As is the case with siltation, the effects of many pollution point sources are felt in downstream areas. This can result in the closure of shellfish harvesting areas.

11.2.1 Petro-Canada

This service center station and apartment complex located in Montague (Map 11L/2) constitutes a pollution point source. The sewage system does not have an adequate drainage area. The problem has been addressed in the past but corrective action has yet to be taken.

11.2.2 Montague Sewage Treatment Facility

This facility (Map 11L/2) is considered to be a pollution point source only because there are unnatural materials being discharged into the Montague River. The biological oxygen demand (BOD) levels of the effluent are less than 20 parts per million therefore, the discharge is not considered to be a problem (Reeves, 1988).

11.3 Instream Obstructions

Numerous other factors may also influence the suitability

of the watershed's streams for fish habitat. Fallen trees or other debris in the streams could present problems for fish passage. Improperly installed culverts, insufficient water flow and non-existent or inadequate dam bypass structures may also pose as barriers to successful fish passage.

11.3.1 Brooklyn I

The bypass channel at Brooklyn Pond, located on Browns Creek (Map 11L/2), is obstructed by debris thus rendering fish passage impossible.

11.3.2 Brooklyn II

A tributary of Browns Creek (Map 11L/2) is blocked by a beaver dam making fish passage impossible. There is a bypass channel but the water is too shallow for fish passage. As part of a habitat improvement program, the beaver dam was removed in August 1988 by Montague Watershed Project staff.

11.3.3 Heatherdale

A beaver dam at Heatherdale Pond, located on the Valleyfield River (Map 11L/2), creates a complete barrier to fish passage.

11.3.4 Upper Montague

The water level within the culvert on Route #210 (Map 11L/2) is too low to allow for successful fish passage. There is also a considerable amount of debris in this unnamed tributary of the Montague River which restricts water flow.

11.3.5 Lower Montague

A dam on French Creek, a tributary of the Montague River located near its mouth (Map 11L/2), is constructed of tires and creates a complete barrier to fish passage.

11.3.6 Bellevue

A beaver dam, located at the mouth of a bypass channel on Mathesons Pond (Map 11L/2), which is part of the Valleyfield River system, creates a complete barrier to fish.

11.3.7 Lewes

A beaver dam, located at the mouth of a bypass channel on the Valleyfield River system (Map 11L/2), creates a complete barrier to fish passage.

REFERENCES

Bears, D., Owner/Operator, Manada Cruises, Montague, pers. comm., 1988.

Brown, I., P.E.I. Department of Agriculture, Charlottetown, pers. comm., 1988.

Canada Land Inventory, Soil Capability for Agriculture, n.d.

Canadian Wildlife Service, Wetlands Atlas of Prince Edward Island, n.d.

DeHaan, R., P.E.I. Department of Agriculture, Charlottetown, pers. comm., 1989.

Dibblee, R., P.E.I. Fish and Wildlife Branch, Charlottetown, pers. comm., 1988.

Dornan, A. and W. Judson, A Study of Snag Utilization by Cavity Nesters in a Riparian Habitat on P.E.I., Montague, 1989.

Environment Canada, Land Capability for Recreation, n.d.

Farmer, S., U.P.E.I., Charlottetown, pers. comm., 1988.

Green, A., Administrator, Town of Montague, pers. comm., 1989.

Horne, F., S. Knudson, A. Rice, and C. Roumbanis, 1988 Scenic Heritage Roads Program - Final Report, Island Nature Trust, Charlottetown, 1988.

Inland Waters Directorate, Environment Canada, Internal Memo Report - Montague River Demonstration Project on Highway Erosion Control, Dartmouth, N.S., April 5, 1989.

Kelly, D., U.P.E.I., Charlottetown, pers. comm., 1988.

MacLean, S., Director of Water Safety, Canadian Red Cross Society, Charlottetown, pers. comm., 1989.

MacWilliams, K. and I. Judson, Estuarine Resource Report - Montague River, 1973.

Martens, F. and J. Mermuys, Tobacco Farmers, Montague - Valleyfield Rivers Watershed Complex, pers. comm., 1988.

McLennan, A., Montague River Watershed Integrated Management Pilot Project, Montague, pers. comm., 1988.

Murphy, C., Environmental Management Division, P.E.I. Department of Community and Cultural Affairs, Charlottetown, pers. comm., 1988.

Murphy, L., Fisheries and Oceans Canada, Charlottetown, pers. comm., 1989.

Murphy, S., P.E.I. Department of Agriculture, Charlottetown, pers. comm., 1988.

P.E.I. Department of Tourism and Parks, Canoeing in Prince Edward Island, n.d.

P.E.I. Department of Tourism and Parks, 1988 Visitors Guide, Charlottetown, 1988.

Pharo, C., Agriculture Canada, Charlottetown, pers. comm., 1988.

Reeves, D., Solid Wastes Management Section, P.E.I. Department of Community and Cultural Affairs, Charlottetown, pers. comm., 1988.

Sheidow, D., Fisheries and Oceans Canada, Charlottetown, pers. comm., 1988.

Stewart, W., Conservation Officer, Fish and Wildlife Branch, P.E.I. Department of Community and Cultural Affairs, Montague, pers. comm., 1988.

Taylor, K., Inland Waters Directorate, Environment Canada, Dartmouth, N.S., 1988.

Thompson, R., Manager, Montague River Watershed Integrated Management Pilot Project, Fish and Wildlife Branch, P.E.I. Department of Community and Cultural Affairs, Charlottetown, pers. comm., 1988.

Thompson, R., Integrated Land Management · Montague River Watershed · Prince Edward Island · Interim Report No. 4, Wildlife Habitat Canada, Charlottetown, 1988.

VanWeichen, N., Recreation Director, Town of Montague, pers. comm., 1988.

Water Resources Branch, P.E.I. Department of Community and Cultural Affairs, Prince Edward Island Active and Abandoned Waste Disposal Site Survey · Phase I, Charlottetown, 1983.

Wilson, M., U.P.E.I., Charlottetown, pers. comm., 1988.

Younie, C., P.E.I. Department of Agriculture, Montague, pers. comm., 1988.